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The surface of the ice is undulatory, conforming to the surface of the underlying ground. In one place the slope is opposite to the movement of the ice. The glacier as a whole may be traveling uphill for several hundred feet, but the total rise of the upper surface is thought not to exceed 20 feet.

The glaciers are not notably advancing or retreating; in most places cliff terminations at the shoreline indicate advance, but occasional rounded "snout" endings bear witness to a slight retreat. The small number of ice falls from the cliffs also disproves any notable advance. In certain places the ice strata are slightly turned up at the glacier edges, but there is no sudden upturning at the end; this conforms to the other indications of but slight movement.

Englacial material is rare and consists chiefly of wind-dropped rock; sand, pebbles, and boulders are uncommon. In one place the ice grains were seen to be drawn out and arranged in sweeping curved lines which follow the direction of glacial flow. The bounding crystal faces are usually not plane but curved.

From imperfect data collected on the speed of temperature waves through the ice, it appears that a wave of about 5° change in temperature penetrates 2 feet in about 2 days, and 4 feet in about 5 days.

The islands seem to be the serrated tops of a mountain range which has been deeply dissected by glaciers while the islands stood at a markedly higher elevation above the sea.

T. T. Q.

The Upper Devonian Delta of the Appalachian Geosyncline. By JOSEPH BARRELL. In three parts. Am. Jour. Sci. [4th Ser.], XXXVI (November, 1913), 429-72; XXXVII (January, 1914), 87-109; XXXVII (March, 1914), 225-53, Figs. 5.

The Upper Devonian Oneonta and Catskill formations, that consist of alternating red shales and gray sandstones, of the Appalachian geosyncline in southeastern New York and northeastern Pennsylvania are believed to be "subaerial delta deposits [of westward-flowing streams] in a dry but not arid climate; a climate probably equable in temperature but subject to seasonal rainfall." The Oneonta is 1,000 feet thick in the Catskill Mountains; the Catskill runs up into thousands of feet in thickness. The Portage and Chemung formations are the shallow-sea equivalents of the Oneonta and Catskill beds. The inland sea in which the former were deposited bordered the subaerial delta on the west and southwest. The included map "shows the shore line at the close of the

Devonian farther west than any previous map but the margin of the sediments farther east, except for the New Jersey strait of Schuchert which is here eliminated." The Upper Devonian sediments are believed to have extended northward beyond Lake Ontario and as far eastward as the margin of the present coastal plain; their removal over a great part of this area is referred to pre-Newark (Mid-Triassic), Jurassic, and post-Jurassic (Comanche and Cretaceous) erosion epochs. These Upper Devonian beds apparently formed a great piedmont plain that stretched westward from Appalachia; the Skunnemunk conglomerate (2,500 feet thick) is a remnant. This plain thickened from east to west and in so doing changed from coarse to fine sediments. The indications are that the drainage divide of Appalachia "was at least as far east as the present 100-fathom line southeast of Long Island and New Jersey."

V. O. T.

Geology and Ore Deposits of the Monarch and Tomichi Districts, Colorado. By R. D. CRAWFORD. Bull. Colo. Geol. Surv. No. 4, 1913. Pp. 317, pls. 15 (including 4 maps), figs. 15.

The Monarch district lies in the southwestern part of Chaffee County, Colorado, on the east slope of the Sawatch Range. The Tomichi district, which is in Gunnison County, is on the west slope of the range and joins the Monarch district on the west.

The sequence of formations is as follows: pre-Cambrian gneisses, schists, granites, pegmatite, and quartzite; the probably Upper Cambrian Sawatch quartzite ($20\pm$ feet); the mid-Ordovician Tomichi limestone (400 feet); the Upper Devonian and early Mississippian Ouray limestone (600–800 feet); the Pennsylvania Garfield formation (2,800 feet); the Permo-Pennsylvanian (?) Kangaroo formation (about 3,000 feet); post-Carboniferous quartz monzonite, granular rocks, porphyries, flow, and volcanic breccia; Pleistocene and later glacial and fluvio-glacial deposits; recent deposits.

The Sawatch quartzite does not outcrop in the Monarch district. In the Tomichi district, the Garfield formation is only a few hundred feet thick, and the Kangaroo formation is wanting.

Unconformities exist between the following formations: the pre-Cambrian and Sawatch, the Sawatch and Tomichi, the Ouray and Garfield, the Garfield and Kangaroo, the Kangaroo and volcanic breccia, the Pleistocene and older deposits. Regarding the interval between the Tomichi and Ouray, the author notes that "although one